Teacher competencies in game-based pedagogy

Tuula Nousiainen [a,*], Marjaana Kangas [b], Jenni Rikala [a], Mikko Vesisenaho [c]

[a] Finnish Institute for Educational Research, University of Jyväskylä, P.O. Box 35, FI-40014 Jyväskylä, Finland
[b] Centre for Media Pedagogy, University of Lapland, P.O. Box 122, FI-96101 Rovaniemi, Finland
[c] Department of Teacher Education, University of Jyväskylä, P.O. Box 35, FI-40014 Jyväskylä, Finland

HIGHLIGHTS

- There are different approaches to implementing game-based pedagogy (GBP).
- Implementing GBP necessitates various teacher competencies.
- Pedagogical, technological, collaborative and creative competencies were identified.
- Understanding GBP-related competencies supports teachers' professional development.

ARTICLE INFO

ABSTRACT

This study examines what kind of competencies teachers need in using game-based pedagogy (GBP). In our conceptual framework, GBP entails four approaches: using *educational games* or *entertainment games*, learning by *making games*, and using *gamification* in learning. Our data, consisting of teachers' documentation, thematic interviews and questionnaires, were analysed using qualitative content analysis. Four main competence areas were identified: *pedagogical, technological, collaborative* and *creative*. The results are applicable for developing teacher education and in-service training, as teacher competencies in game-based learning will be more integral to teachers' professional knowledge and skill repertoires.

© 2018 Elsevier Ltd. All rights reserved.

1. Introduction

Novel technologies and games play an increasing role in twenty-first century education (Kapp, 2012; Van Eck, 2006). In a digitalised society with renewed curricula, meaningful integration of new tools and technology into teaching and learning depends on teachers' ability to a) structure the learning environment in new ways, b) merge new technology with a new pedagogy and c) develop socially active classrooms encouraging cooperative interaction, collaborative learning and group work (UNESCO, 2011). This requires broad management skills and teacher roles.

In game-based learning, teachers play important roles in enhancing the learning and motivational aspects and in designing game-based learning processes (Kangas, Koskinen, & Krokfors, 2016; Shah & Foster, 2015). These perspectives are emphasised in many studies that present pedagogical frameworks designed for integrating games into classrooms. Sørensen (2011) introduces the concept of educational design that includes learning objectives, the selection of subject-related content, planning, and the organisation of learning processes in game-based learning. Foster and Shah (2015) present the Play Curricular activity Reflection Discussion (PCaRD) in which the teacher is an agent who connects game-based learning to curriculum. Kangas et al. (2016) found that teachers' pedagogical activities are evident in various game-based learning processes: in planning, in orientation, during the gaming, and after the game-play sessions. These phases are also included in a pedagogical model of creative and playful learning designed for applying play and games in teaching (Kangas, 2010b). As earlier research shows, the teacher's role can vary from a leader to a facilitator and

from an organiser and planner of learning processes to a guide and a tutor during the game-play sessions, depending on the learning goals and the game context (Hanghøj, 2011; Kangas et al., 2016).

However, teachers have been underrepresented in game-based learning literature and comprehensive approaches to teachers' competencies in game-based pedagogy (GBP) are rare (Foster, Shah, & Duvall, 2015; Hwang & Wu, 2012). In addition, most approaches still assume that game-based learning's effectiveness is solely due to the game effect (Foster et al., 2015; Young et al., 2012). As it has been acknowledged, technologies and games do not guarantee meaningful learning experiences (Löfström & Nevgi, 2007); much depends on teachers' pedagogical practices (Rikala, 2015), knowledge, skills (Shah & Foster, 2015), personal interest and pedagogical and emotional engagement (Kangas, Siklander, Randolph, & Ruokamo, 2017). An approach is needed where the effect of game-based learning is studied while also considering teachers' competencies and roles, the game-based pedagogical process and the context the game is integrated into (Foster et al., 2015; Kangas et al., 2016). Earlier research has shown that sound pedagogical models to follow, as well as relevant teacher competencies, are important for successfully implementing GBP (Barab, Gresalfi, & Ingram-Goble, 2010; Egenfeldt-Nielsen, 2005; Hamari & Nousiainen, 2015; Meyer & Holm Sørensen, 2011; Shah & Foster, 2015; Williamson, 2009).

The aim of this paper is to identify possible competence areas teachers need in GBP. The study focuses on the basic education context entailing both primary and lower secondary school, considering teacher competencies and GBP in a broad pedagogical perspective, including teachers' activities in actual teaching practices and processes — before, during and after game play inside/outside the classroom (cf. Kangas et al., 2016). We combine an earlier pedagogical model of creative and playful learning (Kangas, 2010bb) and four game-based approaches (Nousiainen, Vesisenaho, & Eskelinen, 2015) into a conceptual and pedagogical framework for examining teacher competence areas in GBP. Our focus entails nondigital learning environments as well as digital games. Based on authentic implementations of GBP, we aim to answer the research question: *What kind of competencies do teachers need in using different game-based pedagogical approaches?*

2. Theoretical background

The study consists of two key concepts: game-based pedagogy (the context for the research) and teacher competence (the investigated phenomenon).

2.1. Game-based pedagogy

In our study, we define GBP as a pedagogy that is grounded on different implementations of four game-based approaches (Nousiainen et al., 2015): using *educational games,* using *entertainment games*, learning by *making games*, and using game elements in non-game contexts (i.e. *gamification*). The definition encompasses GBP both in digital and nondigital contexts. The first three approaches are based on Van Eck (2006) definition of game-based learning, while gamification has more recently become prevalent as a separate concept (e.g. Deterding, Dixon, Khaled, & Nacke, 2011; Kapp, 2012). In this categorisation (Fig. 1), 'playfulness' is defined as a mindset and stance that cross-cuts all game-based approaches.

In practice, different GBP approaches often coexist and overlap. For example, a learning project might be based on a fictional narrative where one task involves solving a mystery within an entertainment game, another involves demonstrating a specific skill in an educational game, and yet another requires creating a challenge for peers by making a small game using a game-creation tool.

Educational games, designed to address specific learning objectives and support the learner in reaching certain outcomes (De Freitas, 2006; Dondi & Moretti, 2007), are often the most approachable way of bringing GBP into teachers' practices. They also lend themselves to study of their effectiveness; much research focuses on the learning effects of particular educational games. Positive learning outcomes and experiences have been found, for example, in science (Corredor, Gaydos, & Squire, 2014; Squire & Jan 2007), mathematics (Kebritchi, Hirumi, & Bai, 2010; Shin, Sutherland, Norris, & Soloway, 2012), literacy learning (Richardson & Lyytinen, 2014), collaboration (Hämäläinen & Oksanen, 2014), and the self and identity (Chee & Tan, 2012). Usually, games are brought into class to enhance learners' motivation, but the motivational effects of educational games do not necessarily last beyond initial novelty (Ronimus, Kujala, Tolvanen, & Lyytinen, 2014). Another challenge relates to whether the learning content is adequately integrated with the game mechanics and to what extent the game supports the learner in focusing on aspects essential for learning (Devlin, 2011; Egenfeldt-Nielsen, 2011). Consequently, promoting game-based learning at school can be sustained, according to Shah and Foster (2015), in cases where teachers' knowledge of games and their curricular relevance is sufficient.

An alternative approach is to build on the inherently motivating nature of *entertainment games,* not primarily intended for educational purposes and therefore requiring more from the teacher, as there is no built-in pedagogical content, and the existing content may sometimes be incorrect or misleading (Van Eck, 2006). Yet entertainment games lend themselves to flexible use, so with innovative ways of applying and integrating them with other practices, they can be useful (Van Eck, 2006). Teachers must attune learners to what is important *within* the game and support their learning *beyond* the immediate game design (Gresalfi, Barnes, & Pettyjohn, 2011). With additional activities complementing the game play, the game world and narrative can be expanded beyond the game itself (Charsky & Mims, 2008; Van Eck, 2006). Entertainment games have also been used as part of broader playful or gamified activities where their role is to provide a narrative context, challenge, or mystery in which the learners engage (Nousiainen et al., 2015).

The third approach to implementing GBP is *learning by making games* (Kangas, 2010a; Vos, van der Meijden, & Denessen, 2011; Yang & Chang, 2013). One goal is enhancing students' understanding of specific learning content; thus, when designing and building a game — as opposed to merely playing one — the learner must effectively construct new relationships with knowledge and learn new things (Kafai, 2006). Game design forces students to solve problems and consider things from different viewpoints (Kangas, 2010a; Randolph, Kangas, Ruokamo, & Hyvönen, 2016). Thus it has recently also been closely connected to the development of learners' key competencies such as thinking skills, ICT competencies, communication and creative expression (Hayes & Games, 2008; Kafai & Resnick, 1996; Kangas, 2010a, 2010b; Pelletier, Burn, & Buckingham, 2010; Robertson, 2012; Yang & Chang, 2013). Key competencies or twenty-first century skills (Binkley et al., 2012; European Commission, 2018) refer to broad skills and competencies students need in the rapidly changing world, and there is a current significant educational shift towards them (Caena, 2014).

The fourth approach, *gamification,* turns a non-game activity into a game to make it more attractive and motivating (Deterding et al., 2011; Farber, 2015; Stenros, 2015). Game thinking and game elements engage learners (Deterding et al., 2011; Kapp, 2012)